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**PRE-APPEAL BRIEF REQUEST FOR REVIEW**

Docket Number (Optional)

BFM-02801

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on April 9, 2008Signature Typed or printed name Sandra PIRES

Application Number

10/803,872

Filed

March 18, 2004

First Named Inventor

Radoslaw Romuald ZAKRZEWSKI

Art Unit

2129

Examiner

COUGHLAN, Peter D.

Applicant requests review of the final rejection in the above-identified application. No amendments are being filed with this request.

This request is being filed with a notice of appeal.

The review is requested for the reason(s) stated on the attached sheet(s).

Note: No more than five (5) pages may be provided.

I am the

- ☐ applicant/inventor.
- ☐ assignee of record of the entire interest.  
See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed.  
(Form PTO/SB/96)

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Registration number if acting under 37 CFR 1.34 \_\_\_\_\_



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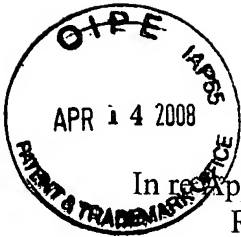
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Submit multiple forms if more than one signature is required, see below\*.

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Radoslaw Romuald ZAKRZEWSKI

Appl. No.: 10/803,872

Art Unit: 2129

Filed: March 18, 2004

Examiner: COUGHLAN, Peter D.

For: METHOD AND APPARATUS FOR  
RANDOMIZED VERIFICATION OF  
NEURAL NETS

Atty. Docket: BFM-02801

**STATEMENT SUBMITTED WITH REQUEST FOR PRE-APPEAL BRIEF REVIEW**

This statement is being filed with a Request for Pre-Appeal Brief Review and Notice of Appeal filed in response to the Final Office Action dated February 1, 2008 received for the above-referenced application.

The system of the presently-claimed invention provides for randomized verification of components, such as neural networks. As one example in the specification, Applicant discloses that a component, such as a neural net, may be provided by a simulation model of an aircraft subsystem. The model may be an approximation of the actual physical system and may introduce a degree of error or uncertainty. The approximation error between the system and the model may rarely be assessed with certainty and may be expressed in probabilistic terms. Thus, even if an algorithm is deterministically verified against a system model, there may remain a statistical uncertainty regarding validity of such result, which suggests that the use of a deterministic approach to verification may not be suitable. (See, for example, page 36, lines 1-21 and page 44, lines 1-22 of the originally-filed specification.) Applicant's presently-claimed invention provides for randomized verification of the accuracy of a component implemented from a model based on using test points for a test of the component that are randomly selected. Applicant has found that a randomized verification method may be applicable to a much wider spectrum of practical problems than previously developed for the deterministic verification approach. (See, for example, page 47, line 11 to page 48, line 11 of the originally-filed specification.)

The rejection of claims 1-36 under 35 U.S.C. 101 for nonstatutory subject matter (and also to the extent this rejection is used in a rejection under 35 U.S.C. 112, first paragraph) is hereby traversed and reconsideration is respectfully requested. The Office Action concludes that determining accuracy of a component is not statutory and states that to be statutory under 35 U.S.C. 101, a claim must be directed to a practical application having a final result that is useful (specific, substantial and credible); concrete (substantially repeatable / non-unpredictable); and tangible (real world / non-abstract). Applicant recites that a component is implemented from a model, and the component is tested according to a randomized verification technique to verify accuracy according to criteria defined in the claim to verify whether the component is an accurate implementation of the model. A number of randomly selected samples is defined according to the recited features and the accuracy is verified according to a selected criterion. Applicant refers, for purposes of example and further explanation, to page 43, line 6 to page 45, line 2 of the originally-filed specification. Applicant submits that the final result of the presently-claimed invention, for example, a component implemented from a model that is verified as accurate according to the recited criteria, is useful, concrete and tangible.

The Examiner concludes an invention that "verifies" has no practical application (top of page 4 of the Office Action). Applicant submits that this conclusion is demonstrably incorrect. There is no exclusion of patentability under 35 U.S.C. 101 simply because a claimed invention is directed to a process of verification. Verification of accuracy of a component implemented from a model is a practical application. For example, one practical application would be determining if a component has not been accurately implemented from a model of the component, in which case, for example, the component could be discarded or indicated as needing to be corrected. In fact, the Office Action initially appears to suggest that the claimed invention has too many applications (see page 3 of the Office Action). Further, on page 9 of the Office Action, the Examiner questions whether the claimed invention would be suitable for a model of flight characteristics of an aircraft wing, a model of the spread of a disease throughout a country or a model of obesity among people of a given region. Applicant submits that if the same method steps, as recited by Applicant, are applied to determine whether a component generated from any of the above-noted models is accurately implemented from the model, then it is unclear why the Examiner considers that the method steps would not recite an invention having a practical application if applicable to all of the above-noted models. Applicant directs particular attention

to discussion in the specification, as noted above, concerning applicability of the claimed invention to an aircraft subsystem, for example. Accordingly, in view of the above, Applicant submits that the rejection should be reconsidered and withdrawn.

The rejection of claims 1, 16-19, and 34-36 under 35 U.S.C. 101 as lacking patentable utility and the rejection of claims 1, 16-17, 19 and 34-35 on the same basis are hereby traversed and reconsideration is respectfully requested. The Office Action appears to object to the use of a confidence value ( $\delta$ ) that is between 0 and 1 and to the accuracy level ( $\epsilon$ ) being between 0 and 1, and the use of these variables in determining a number of randomly selected samples  $M$  in the equation  $M \geq \frac{1}{\epsilon} \ln\left(\frac{1}{\delta}\right)$ . In the prior Office Action, the Examiner had concluded that the equation somehow indicates that "infinity is less than infinity which makes no sense." (see p. 4, August 9, 2007 Office Action.) Applicant respectfully submits that the above-noted confidence value ( $\delta$ ) and the accuracy level ( $\epsilon$ ) for the selection of randomly selected samples in the above-noted equation do not yield the conclusion "infinity is less than infinity" so as to be senseless.

The equation for selecting the number of randomly selected samples  $M$  does suggest that as the confidence value and accuracy level decrease in accordance with the recited features, the number of randomly selected samples required increases, based on the natural log of one divided by the confidence value and one over the accuracy level. The equation characterizes an analysis that the smaller the confidence value and more precise the level of accuracy desired, the higher the number of random samples required, as dictated by the above-noted equation. Applicant submits there is no arbitrary cutoff as the confidence value ( $\delta$ ) and the accuracy level ( $\epsilon$ ) become smaller and smaller with respect to the number of randomly selected samples recited by the claimed invention in accordance with the recited bounds. Instead, the relationship between confidence value, accuracy level and number of randomly selected samples is accurately characterized by the equations, and defines patentable subject matter in conjunction with the other recited features. That is, if a very precise level of accuracy with a very narrow confidence interval is desired then many random samples will be required to achieve this. This is the relationship defined by the equation according to the variables therein. The Examiner's analysis of the equation appears somewhat flawed. Applicant submits that the recited features, specifically in connection with the equation for determining the minimum number of required

samples for a desired confidence value and accuracy level, have utility and would be well understood by one of ordinary skill in the art. Accordingly, Applicant respectfully requests that the rejection be reconsidered and withdrawn.

The rejection of claims 12 and 30 under 35 U.S.C. 112, first paragraph, as lacking enablement is hereby traversed. The Examiner suggests that there is no explanation for receiving a value of zero for  $p\text{-est}$ , an estimate of  $p$  based on a random sample,  $p$ , representing a probability that a randomly selected data value is in accordance with a selected criterion,  $F$  or steps relating to receiving  $\delta$  or steps relating to receiving  $\epsilon$ . Applicant traverses this conclusion. Applicant notes that  $\delta$  is a confidence value and  $\epsilon$  is an accuracy level, as noted above. Applicant also notes that the discussion of  $p\text{-est}$  begins on page 26, line 13 ( $p\text{-est}$  being the same as  $\hat{p}$ , an estimate of  $p$  based on a random sample). As described,  $p\text{-est} = 0$  means that an observed number of error values exceeding prescribed limits is zero. The description of Equations 11-18 in the specification detail the result of  $p\text{-est} = 0$  and for given values of  $\delta$  and  $\epsilon$  that allow the determining of the equation for the number of random samples required ( $M$ ). The steps of receiving the values for  $p\text{-est}$ ,  $\delta$  and  $\epsilon$  in the context of determining the number of randomly selected data values ( $M$ ) seems clear and would be understood by one of ordinary skill in the art. Accordingly, Applicant respectfully requests that this rejection should be reconsidered and withdrawn. Further, to the extent a similar rejection as that set forth above and that was previously applied to claims 1 and 19 is maintained, Applicant submits that the rejection of these claims should also be withdrawn.

The following rejections appeared in the First Office Action dated August 9, 2007, but were not included in the Final Office Action dated February 1, 2008. It is unclear to Applicant whether or not these rejections have been maintained. To the extent these rejections have been maintained, Applicant traverses them for the reasons set forth below.

The rejection of claims 1-4, 8, 12, 19-22, 26 and 30 under 35 U.S.C. 101 as lacking patentable utility because of the use of a selected criterion  $F$  is hereby traversed and reconsideration is respectfully requested. Applicant's selected criterion  $F$  is described in the specification (see, for example, beginning page 16, line 9 of the originally-filed specification) and recited in connection with a step of a method for determining if each of the randomly

selected samples is not in accordance with said selected criterion, F. Applicant discloses examples of selected criterion F in the specification and as recited in the dependent claims. For example, dependent claim 4 recites that the selected criterion F is that  $e(x)$  evaluates to a value that exceeds predetermined bounds. Applicant submits that a step of determining if each of randomly selected samples is not in accordance with the selected criterion F is fully described and enabled by the specification and would be fully understood by one of ordinary skill in the art. Accordingly, Applicant respectfully requests that the rejection be reconsidered and withdrawn.

The rejection of claims 4 and 22 under 35 U.S.C. 112, first paragraph, as lacking a definition in the specification of the functions  $e(x)$ ,  $f(x)$  and  $\phi(x)$  is hereby traversed. As noted beginning on page 13, line 20,  $f(x)$  is a neural net trained to replace a known function  $\phi(x)$  and, as noted beginning at page 16, line 1,  $e(x)$  is an error function defined by  $f(x) - \phi(x)$ . As defined in the claims,  $x$  is one of said points corresponding to one or more neural network inputs, where (for each point  $x$ , evaluated at  $f(x)$  and  $\phi(x)$ ),  $f(x)$  is a neural network output for a corresponding one of said points, and  $\phi(x)$  is an expected output for a corresponding one of said points. Accordingly, an error function determination of  $e(x)$  is based on evaluating, for each point  $x$ , the neural net function  $f(x)$  and known function  $\phi(x)$  that the neural net function is designed to replace, with the difference therebetween being the error function  $e(x)$ . Applicant submits that the claimed terms are fully described and enabled by the specification and that one of ordinary skill in the art would understand and appreciate the claimed features. The term  $\phi(x)$  is used for a known function, the term  $f(x)$  is used for a neural network function trained to model the known function, and the term  $e(x)$  is used for an error function for the difference between the known function and the neural net function. Accordingly, these terms are fully defined. To the extent the Examiner is suggesting that specific functions need to be identified, Applicant traverses this conclusion, noting that the features of a known function, a neural net function trained to model the known function and an error function for the difference therebetween are sufficiently defined in the specification and claims. Applicant has used the terms  $\phi(x)$  for the known function,  $f(x)$  for the neural net function and  $e(x)$  for the difference between the functions. Specific functional definitions beyond these definitions are not required, rather, these terms have been adequately defined as noted above. Accordingly, Applicant respectfully requests that this rejection be reconsidered and withdrawn.